C. 1

CURRICULUM
EDUCATION LIBRARY
UNIVERSITY OF ALBERTA

Curriculum Guide

for

Mathematics 15

Mathematics 25

Interim

CURRICULUM
QA
14
C22
A3
A275
1974

ALTA
510
1974
Gr10-11

CURRGDHT

CURR

Alberta

EDUCATION

1974

Introduction

During the past decade, there has been a great increase in the number of students going into the senior high schools. In the past, the high school was designed to serve a "select" segment of our school population. Present thinking and practice seem to indicate that the high schools must serve all Alberta youth. Hence, it has become vitally necessary to build programs in all areas of curriculum that will serve students of varying abilities and interests.

With the number of students in secondary mathematics on the increase, and with the objectives of secondary mathematics in mind, a three-level stream of mathematics is envisioned for the high schools of Alberta. This three-stream program includes a course sequence for students who have experienced difficulties in past mathematics courses, a course sequence of medium difficulty, and a course sequence for the most able students. The Mathematics 15 - 25 sequence has been designed as a program for the students of low achievement.

In the past, many students have not attained a measure of success due to the difficulty of the material in relation to their ability, to lack of motivation, to ineffective work habits, and to the rigidity of course organization. This course is an attempt to overcome some of these factors by allowing flexibility in the choice of content, in time allocations, and by encouraging the use of a wide variety of instructional techniques. The standards must be set by the capabilities of the students.

Much of the success of this program will depend upon the teacher. It is hoped that the teacher will be an understanding person, concerned with the development of students who are experiencing difficulty in mathematics, and one who recognizes the problems involved in this area of teaching. For maximum success, the teacher must be willing to try new ideas, and to learn from his students as well as from his colleagues. He must be sensitive to the needs of the students.

NOTE:

This Curriculum Guide is a service publication only. The information is prescriptive only insofar as the content of the Guide duplicates that contained in the Program of Studies for Senior High Schools of Alberta. The Curriculum Guide contains, as well as content, methods of developing the concepts, suggestions for the use of teaching aides, and lists of additional reference materials.

Digitized by the Internet Archive
in 2012 with funding from
University of Alberta Libraries

http://archive.org/details/mathematics1525cg74albe

TABLE OF CONTENTS

	Page
Objectives	1
Mathematics 15	2
Mathematics 25	3
References (Student)	4
Recent Publications	6
For Teachers Use	8
Addresses for Publishing Companies	9
Suggestions for the Teacher	10
Flow Charts	15

Objectives: Mathematics 15 - 25

General Objectives

1. To develop an understanding of mathematics as a creation of man and to develop an appreciation of the contribution of this discipline to the progress of civilization.

2. To develop precision in thought and expression.

3. To develop and maintain an understanding of the operations and concepts of mathematics.

4. To develop and maintain skill in mathematical operations.

5. To develop powers of logical analysis of problems and of presenting their solution in a clear and precise manner.

6. To develop mathematics as a way of thinking as well as a way of computation.

Specific Objectives

1. To extend the student's knowledge of mathematical operations and his ability to apply these.

2. A revitalization of interest in mathematics through successful experiences at the student's level of understanding and through the use of novel approaches.

3. To develop an appreciation of mathematics as a living, growing, and changing area of work.

Mathematics 15

Text: Kinney, Ruble, Brown, General Mathematics, A Problem Solving Approach, Book One, Holt, Rinehart, and Winston, 1967. (Out of print).

New Text: Kinney, Ruble, Brown, Problem Solving Mathematics, Holt, Rinehart, and Winston, 1972.

Course Outline:

The following topics should be considered as a suggested list only. Teachers should feel free to modify the program to suit the needs and interests of their students. Such modification may include the deletion and/or addition of certain topics. In cases where students will follow the Mathematics 15 - 25 sequence, attention should be given to those topics of Mathematics 15 which are considered as desirable preparation for Mathematics 25. Not all topics listed are treated in the recommended texts. Teachers should consult the reference section (p. 4-8) for resource materials.

1. Numeration systems.

2. Basic Algebra:

    (a) Natural numbers, integers, fractions, and rational numbers
    (b) Ratio and Proportion
    (c) Equations
    (d) Problem solving through equations

3. Geometry:

    (a) Measurement
    (b) Similarity
    (c) Congruence

4. Probability.

5. Business Mathematics:

    (a) Interest
    (b) Commission
    (c) Profit and Loss
    (d) Banking services
    (e) Insurance
    (f) Payroll

6. Statistics - Presentation and interpretation of data.

Mathematics 25

Text: Kinney, Ruble, Brown, General Mathematics, A Problem Solving Approach, Book Two, Holt, Rinehart and Winston, 1968. (Out of print).

New Text: Kinney, Ruble, Brown, Problem Solving Mathematics, Holt, Rinehart and Winston, 1972.

Course Outline:

The following topics should be considered as a suggested list only. Teachers should feel free to modify the program to suit the needs and interests of their students. Such modification may include the deletion and/or addition of certain topics. Not all topics listed are treated in the recommended texts. Teachers should consult the reference section (p. 4-8).

1. Basic Algebra:

    (a) Equations (2 variables)
    (b) Graphs (2 variables)
    (c) Square Roots (tables)
    (d) Problem Solving
    (e) Exponents

2. Geometry and Trigonometry

    (a) Symmetry
    (b) Right triangle and Pythagorean relation
    (c) Space
    (d) Trigonometric ratios

3. Management of Personal Property

    (a) Stocks, Bonds, and Investments
    (b) Automobile
    (c) Real Estate
    (d) Taxation
    (e) Consumer Credit

4. Application of Mathematics principles to

    (a) Construction
    (b) Sheet Metal
    (c) Electricity
    (d) Food Preparation
    (e) Machine Shop

REFERENCES

The following are a few of the many titles recommended for the mathematics library. The books and materials listed are especially appropriate for the Mathematics 15-25 program.

Sets, Probability and Statistics, 1968. 35 pp. (A free student workbook. There are ten other booklets in the Life Insurance field available free in classroom sets.) Canadian Life Insurance Association.

An Introduction to Probability, 1968. 86 pp. Mumford, D. L. and H. L. Ridge. Copp-Clark Publishing Company.
Managing Personal Property, 1968. 64 pp. (A unit especially for Business Education students.) Copp-Clark Publishing Company.
Payroll, 1968. 51 pp. (A unit especially useful for Business Education students.) Copp-Clark Publishing Company

Mathematics for Today 10, 1968. 352 p. Bonham, G.
Chapter 6: Managing Personal Property
Chapter 7: Payroll
(Other chapters are appropriate also.) J. M. Dent and Sons (Canada) Ltd.

Applied Business Mathematics, 1967. 578 pp. Piper, Gruber, Milne. (A comprehensive book on business mathematics.) W. J. Gage, Ltd.

Mathematics A Liberal Approach, 1964. 420 p. Dodes, I.
Chapter 7: The Math Laboratory
Chapter 9: Indirect Measurement
Chapter 10: Advertising, Editorials and Logical Thinking
Chapter 11: Modern Problems in Mathematics
General Publishing Company Ltd.

General Math Series, Book 2, 1966. 470 p. Attridge, D.
Chapter 13: Relations and Graphs
Chapter 14: Mathematics in Business
Chapter 15: Banking and Interest
Ginn and Company.
General Math Series, Book 3, 1968. 470 p. Attridge, D.
Chapter 6: Presentation and Interpretation of Data
Chapter 7: Ratio, Proportion and Variation
Chapter 8: Purchasing Personal Property
Chapter 9: Payroll Preparation
Chapter 10: Banking and Interest
Ginn and Company.

Trouble Shooting Mathematics Skills, 1966. 375 pp. Lindsay, H. (Material will help teacher diagnose difficulties. Contains other suitable material from business world.) Holt, Rinehart and Winston of Canada, Ltd.
Foundations of Mathematics, 1965. 438 pp. Wiebe, A. and J. Dean. (Contains open-end problems and laboratory approach.) Holt, Rinehart and Winston of Canada, Ltd.

Exploring Mathematics on Your Own, 1961. Johnson, D. and W. Glen. Only 8 booklets now available:
Sets, Sentences and Operations
Computing Devices
Curves in Space
The Pythagorean Theorem
Short-Cuts in Computing
Finite Mathematical Systems
Logic and Reasoning
Invitation to Mathematics
McGraw-Hill Publishing Co.

Retriev-O-Math. (A set of 76 assignment cards with a teacher's manual.) Midwest Publications Company Inc.
Computer Mathematics 1, Student's Text, 1966. 40 pp. Smith, Eugene and J. Hursch. Teacher's manual to the above. (An elementary introduction to computers through student participation.) Midwest Publications Company Inc.

Stereograms. 1966. 44 pp. Stover, D. (Explains and shows how to make stereograms.) Thomas Nelson and Sons (Canada) Ltd.

Experiences in Mathematical Discovery, 1967. Five separate units as follows:

Unit 1:	Formulas, Graphs and Patterns	60 p.
Unit 2:	Properties of Operations with Numbers	38 p.
Unit 3:	Mathematical Sentences	35 p.
Unit 4:	Geometry	98 p.
Unit 5:	Arrangement and Selection	130 p.
	Answers for Units 1-5	129 p.

National Council of Teachers of Mathematics
Paper Folding, 1957. 32 pp. Johnson, D. (Some interesting approaches to geometric concepts.) National Council of Teachers of Mathematics.
Polyhedron Models, 1966. 43 pp. Wenninger, M. J. (Shows construction details of Platonic, Archimeadian, Stellated, and other solids.) National Council of Teachers of Mathematics.

RECENT PUBLICATIONS

The following listed texts are recent publications which are recommended, at present, as teacher references. They have been reviewed as alternatives for students' texts and for possible piloting in the province.

Fundamentals of Mathematics, 1971. 457 pp. Stein, E. I.
Includes arithmetic, algebra, informal geometry, graphs and statistics, a short chapter on consumer and technical mathematics with a reasonable amount of practice material on skills and a combination of metric and English. Macmillan Company of Canada Ltd.

Motivational Mathematics, 1973. Books 1-5. Kelly, B. G. A. (Dr.)
A series of five softcovered booklets covering general mathematics, basically used for lower level groups. These are limited in both business and practical mathematics. Book 1 begins with basic number work and Book 5 includes reasonable areas involving linear systems, coordinate geometry, formulas in metric geometry and in science. Some good motivational aspects are evident. Macmillan Company of Canada Ltd.

Consumer Related Mathematics--A Business Approach, 1971. 306 pp.
Kravitz, Wallace W. and Vincent Brant. Contains skill development and includes practical application with a variety of business and consumer mathematics. The geometry section is reasonable with good applications of scale drawings. Note: No algebra and the edition is American. Holt, Rinehart and Winston of Canada Ltd.

Math Probe, Elliot, Bye. Books 2, 3 and 4. 1973. The program is designed for the more able student. However, there are excellent sections on business and consumer mathematics which contain a Canadian background in development. A wide range of mathematics concepts are included. Holt, Rinehart and Winston of Canada. Ltd.

Mathematics I and Mathematics II, 1971, two books. Jacobs, Russell F. and Richard A. Meyer. An excellent basic program for development of basic skills. No business or consumer mathematics is available. Longman Canada Limited.

Consumer Mathematics, 1971. 473 pp. Lankford and Coe. Uses decision making as a basis of the program, a comprehensive text on consumer and business mathematics. Geared to the student with a major interest in the business world. Note: The edition is American. Longman Canada Limited.

Business and Consumer Mathematics, 1973. 388 pp. Saake, Thomas F.
A reasonable review of basic skills and graph analysis with the major emphasis on a program for the more able student following a business education program. Sets of worksheets are available and correlated to the text material. Addison-Wesley (Canada) Limited.

Career Mathematics--Industry and Trades, 1974. 415 pp. Lyng, Meconi and Zwick. Technical and industrial, problems related well to concepts; i.e. tie fraction and basic math concepts carefully to applications, well developed, language adequate, solution key and progress texts. Appears excellent for a technical-vocational-type student. Thomas Nelson and Sons (Canada) Ltd.

Applications in Mathematics, 1974. 62 pp. Johnson et al. (Book B) Program is highly motivational--designed for uninterested student--covers a variety of topics, interesting applications. This text is worth examination Does not include any direct emphasis on basic skill development. Gage Publishing Company.

Consumer Related Mathematics, 1971. 306 pp. Kravitz, Brant. Skill development available and good sections on business and consumer math. Holt, Rinehart and Winston of Canada Ltd. Note: American Edition.

Machine Applications for Business Problems, 1973. 202 pp. MacLaughlin and MacLaughlin. Designed for Business Machines program but is a useful reference for business mathematics. Sir Isaac Pitman (Canada) Ltd.

-For Teacher Use-

Biggs, E. E. and J. R. MacLean, Freedom to Learn, Addison-Wesley (Canada) Ltd. A book on how to plan, start, carry out and assess active learning in mathematics. (205 pp.)

Mumford, D. L. and H. L. Ridge, An Introduction to Probability - Teacher's Guide. Copp Clark Publishing Co. (1968, 116 pp.)

Fletcher, T. J., Some Lessons in Mathematics, Cambridge University Press. Contains ideas for lesson planning and content. (1964,)

Johnson, D. and G. Rising, Guidelines for Teaching Mathematics, Wadsworth Publishing Co. Ltd. A resource book for new ideas and approaches to teaching mathematics, (1967, 446 pp.).

Council of Teachers of Mathematics, Growth of Mathematical Ideas, 24th Yearbook. Topics covered for Grades K-12.

Kidd, Kenneth P. et al., The Laboratory Approach to Mathematics, Science Research Associates (Canada) Ltd.

National Council of Teachers of Mathematics, The Slow Learner in Mathematics. 25th Yearbook.

National Council of Teachers of Mathematics, Instructional Aids in Mathematics, 24th Yearbook.

Addresses for publishing companies:

Canadian Life Insurance Association
Educational Division
Toronto, Ontario

Copp-Clark Publishing Co. Ltd.
517 Wellington Street West
Toronto, Ontario
M5V 1G1

J. M. Dent and Sons (Canada) Ltd.
100 Scarsdale Road
Don Mills, Ontario
M3B 2R8

W. J. Gage Ltd.
P. O. Box 5000
164 Commander Blvd.
Agincourt, Ontario
M1S 3C7

General Publishing Company Ltd.
30 Lesmill Road
Don Mills, Ontario
M3B 2T6

Ginn and Company
35 Mobile Drive
Toronto, Ontario
M4A 1H6

Holt, Rinehart and Winston
55 Horner Avenue
Toronto, Ontario
M8Z 4X6

McGraw-Hill Ryerson Limited
330 Progress Avenue
Scarborough, Ontario
M1P 2Z5

Midwest Publications Company Ltd.
P. O. Box 129
1700 West Maple Road
Troy, Michigan
48084

Thomas Nelson and Sons (Canada) Ltd.
81 Curlew Drive
Don Mills, Ontario
M3A 2R1

National Council of Teachers of Mathematics
1906 Association Drive
Reston, Virginia
22091

Suggestions for the Teacher of

Mathematics 15 and 25

This section is divided into three general areas:

(a) General Suggestions
(b) Methods
(c) Reading in the Content

A. General Suggestions

1. Teachers of Mathematics 15 - 25 classes should have an interest in the students in these classes and be aware of their past difficulties. The emphasis in these courses should be on individual student differences and needs rather than course content.

2. Teachers should plan their program only after determining the interests, needs, and capabilities of their students.

3. Time allotments in the course outlines have been intentionally omitted to allow for maximum flexibility. This flexibility enables teachers to discontinue the study of a topic when interest wanes and provides opportunity for innovation and pursuit of special interest areas.

4. The basic premise of this course is the participation of students in the learning process. To facilitate this participation, the laboratory approach should be implemented whenever possible. A mathematics laboratory has been defined as a state of mind. A questioning atmosphere and a continuous involvement with problem-solving situations should be characteristic of this approach. The teacher strives to create an environment suitable for learning through experimentation and active participation by the students.

5. Each student should experience success. Success builds interest, motivates and reduces discipline problems. This does not imply that the work must be simple or of lowest common denominator for the class, but it does imply the development of mathematical concepts should be gradual, systematic, and meaningful.

6. Since some students learn better through physical activity, and through activities which are closely related to relevant problems, it is hoped teachers will draw on the human and physical resources of the Business Education and Technical-Vocational departments of their school when applicable.

7. In the physical plant, the laboratory approach may be incorporated, as resources permit, along the following guidelines:

   (a) replace desks with tables to facilitate group projects and experimentation;

   (b) use paper-folding, scissors, paper, glue, etc. to teach geometric concepts;

   (c) use abaci for teaching numeration systems;

   (d) use playing cards, dice, marbles, probability kits for the concepts of sets and probability;

   (e) use calculators, slide rules, tables as computational aides;

   (f) use puzzles, pamphlets, games for motivation, master skills, and concepts, interest and recreation;

   (g) flow charts are useful for the development of solutions to problems;

   (h) challenge and activity cards help to meet individual differences especially for the more able students. These cards can be developed in the school;

   (i) audio-visual aides such as films, film strips, and overhead projectors can create and maintain interest as well as aid in the understanding of concepts;

   (j) use of local resources; petition local business and industrial concerns for typical mathematical problems encountered in their daily routines. Permission to use the business letterheads creates realism.

8. Computational skill, while desirable, should not be over-emphasized at the expense of student interest. These points relative to the development of computational skills, might be kept in mind:

   (a) diagnosis of areas of student difficulty should precede practice;

   (b) practice should make use of novel approaches by using cross-number puzzles, games such as "Tuf", "krypts", "Napier bones", etc. Calculators can be used to improve computational competency as well as to free students from routine manipulations in order to concentrate on problem situations.

9. The teacher should plan the activities so that very few, if any, home assignments are necessary.

10. Each student may be supplied with a file folder (kept in a filing cabinet in the classroom) in which his daily work is placed. A check-off list of assignments on the front of the folder assists in keeping track of work done, yet motivates the student. The fact that the daily work is on file rather than discarded gives the student a feeling the work is of value.

5. Methods

This guide presents the following teaching suggestions since the success of the Mathematics 15 and 25 programs will depend to a great extent on the teacher's ability to use a variety of interesting methods in which students are actively involved. This is especially essential in the longer semester classes. The teacher is encouraged to plan his lessons imaginatively. In one class, the teacher may use several activities. Some of the many activities are listed:

(a) presentation of a lesson by a teacher

(b) teacher guided inquiry lesson

(c) class or group discussions

(d) a related film or general interest film

(e) small group experimentation on problems

(f) guided study using reference booklets

(g) model building

(h) assignment directed around the calculator

(i) concept developed through use of calculator

(j) assignments from text

(k) worksheet assignment

(l) puzzles, games, cross-number puzzles

(m) flow-charting mathematical problems

(n) flow-charting mathematical problems

(o) practical problems from industry and business

(p) related field trips (e.g., indirect measurement)

(q) lessons built around calculation aids such as Napier's bones, logarithms, slide rule, etc.

(r) open-ended problems

All planning should make allowances for individual student differences. Providing the student with the opportunity to choose between the set of easier problems and the set of harder problems encourages the student to be honest about his own ability.

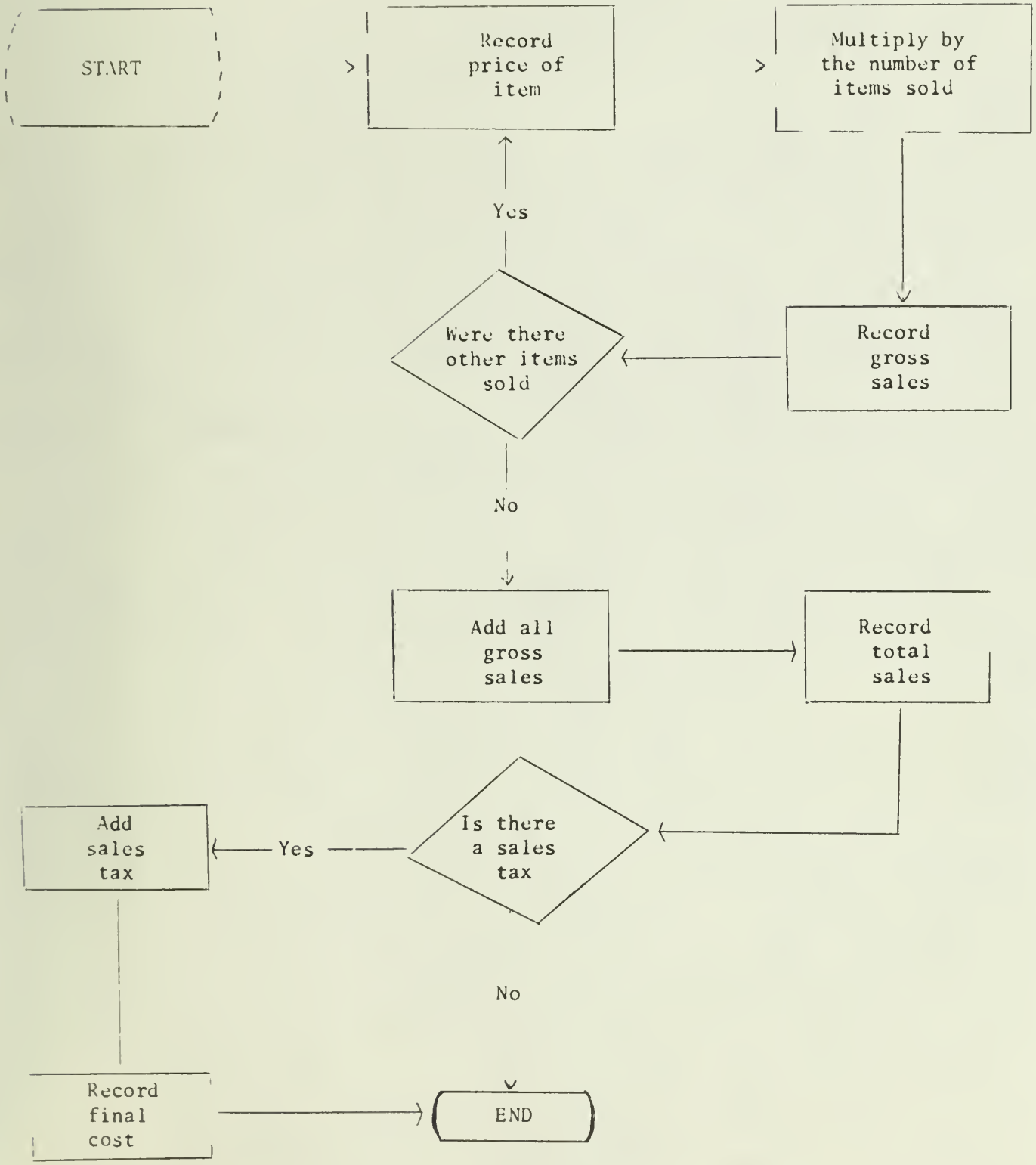
Two examples of the use of flow charts are given here. The first, a non-mathematical problem designed to build the conept of flow-charting while the second is a mathematical solution to a practical problem. Several of the references use flow-charting as an integral part of the mathematics program.

C. Reading in Mathematics

The mathematics teacher is urged to study the *Secondary School Reading Handbook* (Curriculum Branch, September, 1969.) Specific reference is made to mathematics in Chapter V "Reading in the Content Field" section titled "Reading in the Mathematics". This section deals with the skills required for reading in mathematics, suggested teaching techniques and student activities, and suggested teacher references and resource material.

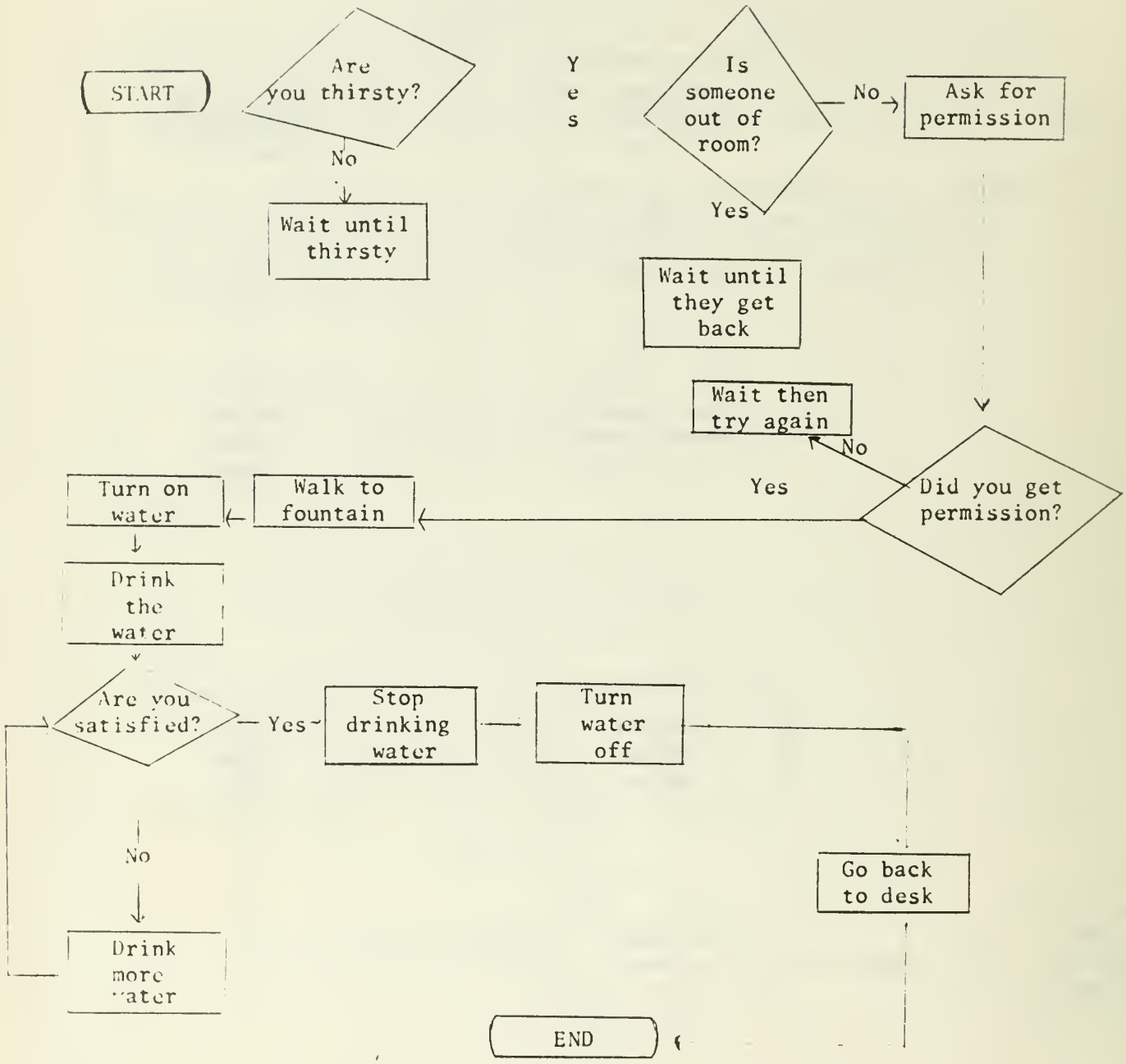
While students in Mathematics 15 and Mathematics 25 generally have low reading ability, they may, in fact, improve this skill as well as mathematical skills when provided with suitable materials in mathematics of appropriate difficulty and interest. Motivation and success are essential.

Flow Chart For Determining Total Sales



Getting A Drink of Water

(Main Ideas With Detail)



QA 14 C22 A3 A275 1974
ALBERTA ALBERTA EDUCATION
CURRICULUM GUIDE FOR
MATHEMATICS 15 MATHEMATICS
39841036 CURR HIST

000017747270

DATE DUE SLIP

QA 14 C22 A3 A275 1974
Alberta. Alberta Education.
Curriculum guide for
Mathematics 15, Mathematics
39841036 CURR HIST

CUR[illegible]ULUM GUIDE

For Reference

NOT TO BE TAKEN FROM THIS ROOM

EXCEPT WITH LIBRARIAN'S PERMISSION